Planning Doc for RI Smpg

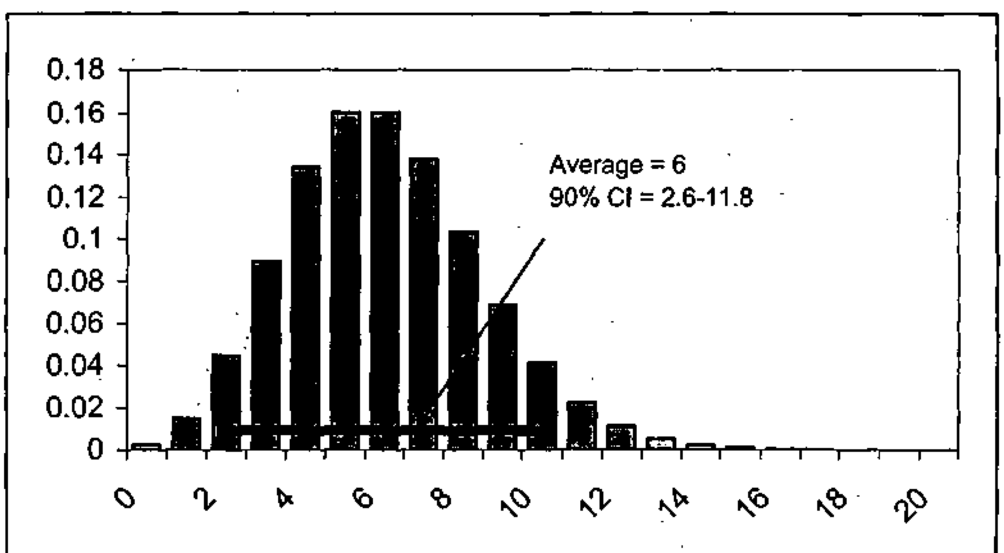
LIST OF DATA COLLECTION TASKS AT LIBBY

Caltegory	Task	Name	Description
Risk assessment	1	Ksd	Collect samples of soil and indoor dust at multiple homes (N = 20-30) (Note--locations need not be related to asbestos levels) (Note-dust must be bulk sample suitable for chemical analysis) Measure several markers (e.g., cadmium, mineral content) in both soil and dust, and plot correlation. Slope = Ksd
	2	Dust K Factors	Re-analyze air and dust samples collected during Phase II Scenario 1 (routine) and Scenario 2 (active cleaning). Improve sensitivity for air and dust so that K factors can be estimated.
	3	Outdoor soil K factors	a) Re-analyze air and soil samples collected during Phase II Scenario 4 (rototilling). Improve sensitivity for air and soil so that K factors can be estimated. Use TEM or SEM for soil if needed. b) Modify post-cleanup sampling design to include sampling outdoor air in vicinity of post-cleanup soils disturbed by standard active disturbance (e.g., raking). Include both bare and grassy areas. Measure asbestos in air with good sensitivity. c) Perform "scenario sampling" at locations where soil is Bin B2 or Bin B1 by PLM-VE.
Soil Analysis	4	Ultra-low Concentration RR	Prepare additional soil PE samples in low range (USGS). Measure DF as a function of concentration by PLM, TEM, SEM. Estimate concentration where sample is reported as a detect at least 90% of the time
	5	Conc in ND	Measure concentration of LA in site soils that are ND by PLM using SEM (USGS) and TEM (lab team)
	5.5	Contribution from vermiculite	a) Evaluate relation between visible VAI and soil concentration using current data b) Investigate use of XRD as a field screening tool
Indoor Cleanup	6	Effect of Contained VAI	Using data from post cleanup confirmation sampling, compare C(dust) levels in homes with and without known VAI remaining in enclosed spaces. Re-analyze to achieve lod sensitivity as needed.
	7	C(air) in homes with dust = Trigger	In homes where C(dust) is near to but does not exceed trigger, measure C(air) following active disturbance and under routine conditions
	8	Effectiveness of HEPA Vac	As part of conformation sampling program, measure C(dust) and C(air) vs time in homes that are actively using HEPA vacs and those that are not to determine if vacs help reduce C(dust)
	9	Time trends	Continue to measure C(dust) and C(air) vs time in homes during post-cleanup confirmation sampling. Look for upward trends indicating recontamination. Determine if trends(if any) correlate with residual sources (e.g., carpets, dustwork etc).
	10	Dust under carpets	Collect dust samples from beneath carpeted areas of homes, analyze for LA. Collect regular dust samples from same homes to evaluate if carpert is a source.
Clearance sampling	11	Margin of safety	Re-analyze clearance air samples at improved sensitivity to derive quatitative estimate of C(air) during active disturbance and compare to C(air) measured during routine conditions in post cleanup confirmation sampling.
Building demolition	12	Demo plan	Develop plan for building demo--work with Aubrey
Ambient Air	13	Ambient Air	Re-analyze ambient and perimeter air to get improved detection limits
Dust analysis	14	Effect of ashing	Develop and implement mini-plan for pilot study on effect of ashing on residential dust samples

POISSON UNCERTAINTY BOUNDS

90 % CI

N	LB	UB	90% CI	(0.5*CI) / BE
25	17.4	34.9	17.5	35%
24	16.5	33.8	17.2	36%
23	15.7	32.6	16.9	37%
22	14.9	31.4	16.5	38%
21	14.1	30.2	16.2	38%
20	13.3	29.1	15.8	40%
19	12.4	27.9	15.4	41%
18	11.6	26.7	15.1	42%
17	10.8	25.5	14.7	43%
16	10.0	24.3	14.3	45%
15	9.2	23.1	13.9	46%
14	8.5	21.9	13.4	48%
13	7.7	20.7	13.0	50%
12	6.9	19.4	12.5	52%
11	6.2	18.2	12.0	55%
10	5.4	17.0	11.5	58%
9	4.7	15.7	11.0	61%
8	4.0	14.4	10.5	65%
7	3.3	13.1	9.9	70%
6	2.6	11.8	9.2	77%
5	2.0	10.5	8.5	85%
4	1.4	9.2	7.8	97%
3	0.8	7.8	6.9	116%
2	0.4	6.3	5.9	149%
1	0.1	4.7	4.7	235%
0	0.0	3.0	3.0	#DIV/0!



TASK 1 ESTIMATE SITE-SPECIFIC Ksd

Step	Description	Notes
1	Select soil marker(s)	Must be easy to measure accurately in soil and dust; No NDs Must occur in soil in fine grained particles Must have no known source in dust besides soil Possible example:soil mineral such as albite (a feldspar) Possible example:trace metal such as cadmium
2	Measure concentration of marker(s) in soil and dust from multiple locations	All samples should be representative composites Sieve soil sample to get fine-grained (< 250 um) Dust sample must be bulk (to allow analysis)
3	Calculate Ksd at each location	Location-specific Ksd = C(dust) / C(soil)
4	Characterize distribution of Ksd values	Calculate mean Ksd Select "high end" value (e.g., 90th percentile)

DQOs

Number of locations (homes)

Ksd ranges from 0 to 1

Assume beta distribution, mean = 0.33, 90th = 0.57

	CV		90% CI	
N	mean	90th	mean	90th
5	24.0%	22.8%	0.21-0.47	0.31-0.69
10	16.9%	17.6%	0.24-0.43	0.38-0.69
30	9.8%	10.7%	0.28-0.39	0.47-0.67

Min = 5

Better = 10-20

Sample locations

Not linked to asbestos

Span a range of conditions that influence Ksd

- Number of kids
- Number of pets
- Yard condition (bare, covered)

TASK 2 Re-Analysis of Air and Dust Samples from Phase II to Estimate K(dust)

Step	Description	Notes
1	Re-analyze air and dust samples collected during Phase II Scenario I (routine) and Scenario II (active cleaning)	Data are limited May need more data---see other tasks below that will help
2	Calculate K(routine) and K(active)	K = C(air) / L(dust)
3	Select typical and high-end values	
4		

Sample Summary

Scenario 1 (routine)	Locations (homes)	16
	Personal air samples (all have good volume)	16
	Stationary airs (1-3 per home)	26
	Dust samples (all are from Scenario 2 pre-cleaning)	8

Scenario 2 (active cleaning)	Locations	19
	Personal air (full period)	42
	Personal air (excursion)	86
	Stationary air (pre-cleaning)	35
	Stationary air (during cleaning)	34
	Stationary air (post-cleaning)	46
	Dust (pre-cleaning)	15
	Dust (post cleaning)	14
	Dust (from pile)	6

DQOs

Dust	Must obtain fairly reliable estimate, since this is in the denominator					
	Set goal of (CI/2) / Best Est <	100%				
	This requires a count of at least	5	structures			
	If loading =	500	s/cm2	and	EFA	1295 mm2
	Then number of GOs =	43			F	0.1
					A	300 cm2
					Ago	0.01 mm2
Air	Assume need to quantify K if K >	2.0E-06	s/cc per s/cm2			
	Set goal of (CI/2) / Best Est <	100%				
	Assume L(dust) =	500	s/cm2			
	The, expected C(air) =		s/cc			
	This requires a count of at least	4	structures			
	If C(air) =	0.0010	s/cm2	and	EFA	385 mm2
	Then number of GOs =	[illegible]			V	3000 L
					Ago	0.01 mm2

TASK 3a Re-Analysis of Air and Soil from Phase II to Estimate K(soil) for Active Disturbance

Step	Description	Notes
1	Re-analyze air and soil samples collected during Phase II Scenario 4 (rototilling of soil)	There is only one location tested; probably will need more Soil tested only by PLM-VE Need C(soil) as s/g; analyze by TEM (PLM-VE)
2	Calculate K(soil)	K = C(air) / C(soil) K has units of s/cc per s/g
3		
4		

DQOs

Soil

Must obtain fairly reliable estimate, since this is in the denominator

Set goal of (CI/2) / Best Est <	50%					
This requires a count of at least	13	structures				
If C(soil) =	2.0E+08	s/g	and	EFA	1295	mm2
Then number of GOs =	8			Ago	0.01	mm2

(about 0.2%)

Air

Set goal of (CI/2) / Best Est <	50%					
Assume K =	1.5E-10	s/cc per s/g (see below)				
This requires a count of at least	13	structures				
Based on K, expected C(air) =	0.0300	s/cm2	and	EFA	385	mm2
Then number of GOs =	28			V	600	L
				Ago	0.01	mm2

Note

Estimation of K based on the assumption that the amount of soil released to air is 150 ug/m3 (10x the NAAQS for PM10)

PM10	150	ug/m3
	1.5E-04	g/m3
	1.5E-10	g/cc
Asbestos conc in soil	2.0E+08	s/g
Conc in air	0.0300	s/cc
K	1.5E-10	

TASK 3b/c Outdoor Air sampling at Locations with Remediated Soils or Low-level Soils

Step	Description	Notes
1	Collect and analyze air and soil samples following standardized disturbance at soil locations where asbesos in soil either a) has been remediated, or b) is Bin B1 or Bin B2 by PLM-VE.	Must achieve reliable estimate for soil Express C(soil) as s/g; analyze by TEM Need to select as "standard disturbance" -raking?
2	Calculate K(soil)	K = C(air) / C(soil) K has units of s/cc per s/g
3		
4		

DQOs

Soil

Must obtain fairly reliable estimate, since this is in the denominator

Set goal of (CI/2) / Best Est <	50%				
This requires a count of at least	13	structures			
If C(soil) =	2.0E+08	s/g	and	EFA	1295 mm2
Then number of GOs =	8			Ago	0.01 mm2

Air

Set goal of (CI/2) / Best Est <	50%				
Assume K =	1.50E-10	s/cc per s/g			
This requires a count of at least	13	structures			
If C(air) =	0	s/cm2	and	EFA	385 mm2
Then number of GOs =	33			V	500 L
				Ago	0.01 mm2

TASK 4 ULTRA LOW CONCENTRATION ROUND ROBIN

Step	Description	Notes
1	Create low PE samples	Nominal = 0%, 0.01%, 0.05%, 0.10%, 0.14% Existing = 0%, 0.14% New = 0.01%, 0.05%, 0.10% Prepare by serial dilution of existing PE (USGS)
2	Analyze by PLM-VE, TEM, SEM	PLM: Classify each as ND (Bin A) or Detect (> Bin A) TEM, SEM: Define DL as mean + 2*stdev of s/g of "blank" soil Classify each as ND or detect
3	Plot DF vs Nominal	
4	Calculate DL as nominal where DF > 90%	

DQOs

Number of samples

To get meaningful estimate of DF, need N = 9 at each nominal
Send 3 replicates of each nominal to each of 3 labs (best performers)

TASK 5   Concentration in Samples ND by PLM

Step	Description	Notes
1	Identify a series of authentic site soils that are ND by PLM-VE	
2	Analyze by TEM and SEM. Quantify as s/g and and mass %	
3		
4		

DQOs

Number of samples

To get meaningful summary statistics, need min of 10 samples

Select from different locations across Libby (spatial representativeness)

TASK 5.5 Evaluation of Vermiculite in Soil

Step	Description	Notes
1	Perform analyses of relation between presence/absence of visible vermiculite in soil and the value of asbestos measured by PLM-VE	Already done...preparing tech memo
2	Investigate methods for quantifying vermiculite in soil using XRD	Have discussed with USGS Likely feasible, but not obviously better than PLM-VE Need samples of soil and vermiculite to test and develop Samples will have to be dried and probably ground for relaible results Thus, not likely to be "real-time" field method

DQOs TBD

TASK 6 Evaluation of Contained VAI as a Potential Source to Indoor Dust

Step	Description	Notes
1	Perform analyses of relation between presence/absence of contained vermiculite on indoor dust levels	Use dust data from post-clean-up sampling May need to re-analyze dust to get better sensitivity Need to classify each house as + or - for residual contained VAI
2		

DQOs Set target N = 10 structures
Assuming

True loading	400	s/cm2
Area vacuumed	300	cm2
EFA	1295	
F	0.1	
Ago	0.01	

Estimated GO's 108

TASK 7 Evaluation of C(air) at Homes with Elevated C(dust)

Step	Description	Notes
1	At locations in CSS where dust is detected but < 5000 s/cm2, measure C(air) during active disturbance and under routine conditions)	This is basically the same as Phase II Scenario 1 and 2 Ensure that analysis achieves adequate sensitivity and accuracy Can be used to supplement calc of K(dust)
2		

DQOs

Dust

Must obtain fairly reliable estimate, since this is in the denominator						
Set goal of (CI/2) / Best Est <	50%					
This requires a count of at least	13	structures				
If loading =	500	s/cm2	and	EFA	1295	mm2
Then number of GOs =	112			F	0.1	
				A	300	cm2
				Ago	0.01	mm2

Air

Assume need to quantify K if K >	2.0E-06	s/cc per s/cm2				
Set goal of (CI/2) / Best Est <	50%					
Assume L(dust) =	500	s/cm2				
The, expected C(air) =		s/cc				
This requires a count of at least	13	structures				
If C(air) =	0.0010	s/cm2	and	EFA	385	mm2
Then number of GOs =	125			V	4000	L
				Ago	0.01	mm2

TASK 8 Effectiveness of HEPA Vacuuming

Step	Description	Notes
1	During CE sampling, measure C(dust) and C(air) [routine] in homes that are and are not using HEPA vacs	Must collect values over time These data will help supplement derivation of K(dust)
2	Calculate time trends, compare trends with and without HEPA	

DQOs

Number of Time Points

Time trends require an minimum of 3-4 points, more is better
Timing of points depends on expected time course of effect of HEPA vacuuming
Assuming that vacuuming is depleting residual sources such as carperts, ducts, etc, could be slow
Option A: I sample set (air,dust) per month for 4-8 months)
Option B: 1 sample set (air,dust) per 2 months for 8-16 months

Number of Homes

Without sense of inter-home variability, hard to estimate
Assume minimum = 3 of each type (HEPA, non-HEPA)

Dust

Set goal of (CI/2) / Best Est <	50%					
This requires a count of at least	13	structures				
If loading =	500	s/cm2	and	EFA	1295	mm2
Then number of GOs =	112			F	0.1	
				A	300	cm2
				Ago	0.01	mm2

Air

Assume need to quantify C(air) if C(air) >	1.0E-04	s/cc				
Set goal of (CI/2) / Best Est <	100%					
This requires a count of at least	4	structures				
If C(air) =	0.0002	s/cm2	and	EFA	385	mm2
Then number of GOs =	128			V	6000	L
				Ago	0.01	mm2

TASK 9 Time Trends in Indoor Exposure Post-remediation

Step	Description	Notes
1	During CE sampling, measure C(dust) and C(air) [routine] in homes following cleanup. Record info on presence/absence of potential residual sources	This is very similar to task 8; combine into one plan These data will help supplement derivation of K(dust)
2	Calculate time trends; look for differences as a function of the presence of residual sources	

DQOs

Number of Time Points

Time trends require an minimum of 3-4 points, more is better
Timing of points depends on expected rate of change
Assuming changes, if present, occur over course of months
Suggest Option B from task 8: 1 sample set (air,dust) per 2 months for 8-16 months

Number of Homes

Without sense of inter-home variability, hard to estimate
Min of 4, ideal = 6-8, with variations in presence/absence of residual sources

Dust

Set goal of (CI/2) / Best Est <	50%					
This requires a count of at least	13	structures				
If loading =	500	s/cm2	and	EFA	1295	mm2
Then number of GOs =	112			F	0.1	
				A	300	cm2
				Ago	0.01	mm2

Air

Assume need to quantify C(air) if C(air) >	1.0E-04	s/cc				
Set goal of (CI/2) / Best Est <	100%					
This requires a count of at least	4	structures				
If C(air) =	0.0002	s/cm2	and	EFA	385	mm2
Then number of GOs =	128			V	6000	L
				Ago	0.01	mm2

TASK10 Dust Under Carpets

Step	Description	Notes
1	Collect dust from under carpets, analyze for LA.	This is very similar to task 9; combine into one plan
2	Collect dust samples over time at homes with LA in dust under carpets	
3	Look for time trend of re-contamination	

DQOs

Number of Time Points

Time trends require an minimum of 3-4 points, more is better
Timing of points depends on expected rate of change
Assuming changes, if present, occur over course of months
Suggest Option B from task 8: 1 sample set (air,dust) per 2 months for 8-16 months

Number of Homes

Without sense of inter-home variability, hard to estimate
Min =3, more is better

Dust Under carpets

Set goal of (CI/2) / Best Est <	50%					
This requires a count of at least	13	structures				
If loading =	5000	s/cm2	and	EFA	1295	mm2
Then number of GOs =	22			F	0.05	
				A	300	cm2
				Ago	0.01	mm2

House Dust

Set goal of (CI/2) / Best Est <	50%					
This requires a count of at least	13	structures				
If loading =	500	s/cm2	and	EFA	1295	mm2
Then number of GOs =	[illegible]			F	0.1	
				A	300	cm2
				Ago	0.01	mm2

TASK 11 Margin of Safety in Clearance Sampling

Step	Description	Notes
1	Re-analyze clearance air samples at improved sensitivity to derive quatitative estimate of C(air) during active disturbance	
2	Collect measures of C(air) during routine conditions following clearance	This is similar to task 9; combine into one plan (?) Reliable quantification may be tough due to expected low levels
	Estimate ratio of C(air) [active vs routine]	

DQOs

Number of Homes

Min of 4, ideal = 6-8

Air	Assume need to quantify C(air) if C(air) >	0.0001 s/cc				
	Set goal of (CI/2) / Best Est <	50%				
	This requires a count of at least	13 structures				
	If C(air) =	0.0002 s/cm2	and	EFA	385	mm2
	Then number of GOs =	250		V	10000	L
				Ago	0.01	mm2

GENERALIZED FLOW CHART

Residence

↓ Cleanup

Clearance Sampling (Time zero)

-Air (active disturbance)

-Dust

↓

Post-cleanup monitoring

Measure C(air) and C(dust) over time

1 set every 2 months for 8-16 months

↓

Data analysis

↓

Look for time trends (task 9)

Look for potential impacts of:

- Use of HEPA vacs (Task 8)
- Known residual sources
  - Contained VAI (task 6)
  - Dust under carpets (task 10)

Compare routine levels to clearance level (task 11)

SRC: For CDM, early on in SAP process, give a list of house/yard "characteristics" that we'll need to span.

CDM: Hi Vol pumps